SPECIFICATION

AIR CONDITIONER AND CONTROL METHOD THEREOF

FIELD OF THE INVENTION

The present invention relates to an air conditioner that is capable of powerful operation in which the fan speed, the operating frequency of the compressor, or the like is temporarily increased, and air conditioning capacity is enhanced. The present invention also relates to a method for controlling the air conditioner.

RELATED ART

Conventional air conditioners are known which are installed in residences, buildings, and the like, and which enhance the comfort of a room by ventilating conditioned air into the room. Such air conditioners maintain a room temperature that is comfortable to the occupants and enhance the comfort of the room by ventilating cool air or warm air into the room.

An air conditioner is provided with an indoor air conditioning unit mounted indoors for performing air conditioning, and an outdoor air conditioning unit mounted outdoors. The indoor air conditioning unit and the outdoor air conditioning unit are connected to each other by a connection pipe, and air conditioning is performed by causing heat to be exchanged between the indoor air and the refrigerant flowing through a refrigerant pipe.

There are also air conditioners in particular among those of this type that perform so-called powerful operation for temporarily increasing the operating frequency of the compressor, the fan speed, or the like and enhancing the air conditioning capacity according to an instruction entered by a user during cooling operation, heating operation, or the like. By entering a command for powerful operation from a remote control or the like, the operating capacity at that moment is temporarily increased. For example, the air conditioning capacity for heating and cooling at that moment is temporarily increased.

<Prior Art 1: JP-A 7-103551>

DISCLOSURE OF THE INVENTION

However, the abovementioned conventional air conditioner has such drawbacks as those described below.

Specifically, when a command is entered for performing powerful operation in the conventional air conditioner described above, the air conditioner is controlled so that the operating frequency of the compressor, the fan speed, or the like is increased, and the air conditioning capacity is enhanced as described above. However, no control is performed

regarding the direction in which the conditioned air is blown at this time, and the direction in which the air is blown is determined by the direction in which the air deflector happens to be turned when the command for powerful operation is entered.

Therefore, although a large quantity of air that is colder than the air during normal cooling operation is fed into the room when the command for powerful operation is entered during cooling, for example, it is impossible for the user to realize that powerful operation is being performed when this air is fed in a direction entirely different from the direction in which people are present. On the other hand, although air that is air-conditioned in a state of increased capacity is fed into the room when the command for powerful operation is entered during cooling, for example, this air sometimes blows directly on the occupants and can cause the occupants to experience an excessive cold sensation and other discomfort during powerful cooling operation, for example.

An object of the present invention is to provide an air conditioner and a method for controlling the air conditioner whereby the direction in which conditioned air is discharged during powerful operation can be controlled.

An air conditioner according to a first aspect of the present invention comprises an air conditioning mechanism for performing air conditioning of indoor air; an air deflector for adjusting the direction in which the conditioned air is discharged; and a control unit for performing powerful operation whereby the capacity of the air conditioning mechanism is temporarily increased. The control unit adjusts the direction of the air deflector so that air is discharged in the direction in which people are present during powerful operation.

During powerful operation in this configuration, not only is the capacity of the air conditioning mechanism including a compressor, fan, or the like increased, but the direction in which conditioned air is discharged into the room is also controlled.

In the conventional air conditioner, the sole difference during powerful operation was that the capacity of the air conditioning mechanism was temporarily increased, and control of the discharge direction of air at that time was not addressed. The direction of the air deflector during powerful operation was determined by whatever direction the air deflector happened to be facing immediately before the command for powerful operation was entered. Consequently, even when the same powerful operation was executed during cooling, for example, the direction of the air deflector could sometimes vary according to the operating conditions immediately preceding the powerful operation.

Therefore, in the air conditioner of the present invention, such effects as the following can be obtained by also controlling the direction of the air deflector during powerful operation.

Specifically, in the air conditioner of the present invention, the direction of the air deflector is controlled so that conditioned air is discharged in the direction in which people are present when the command for powerful operation is entered. The user who entered the command for powerful operation can thereby experience the heightened effects of powerful operation by directly receiving the air that is conditioned in a state of increased capacity of the air conditioning mechanism. In contrast, it is also possible in the air conditioner of the present invention for the direction of the air deflector to be controlled so that conditioned air is discharged in the direction in which people are not present when the command for powerful operation is entered. By this configuration, the room occupants can be prevented from experiencing discomfort due to excessive coldness during cooling operation, discomfort due to direct contact with warm air during heating, or other discomfort.

The air conditioner according to a second aspect of the present invention is the air conditioner according to the first aspect, wherein the control unit adjusts the direction of the air deflector so that air is discharged in the direction in which people are present during powerful operation.

In this arrangement, the direction of the air deflector is controlled so that conditioned air is discharged in the direction in which people are present when the command for powerful operation is entered. The user who entered the command for powerful operation can thereby experience the heightened effects of powerful operation by directly receiving the air that is conditioned in a state of increased capacity of the air conditioning mechanism.

The air conditioner according to a third aspect of the present invention is the air conditioner according to the first aspect, wherein the control unit adjusts the direction of the air deflector so that air is discharged in the direction in which people are not present during powerful operation.

In this arrangement, the direction of the air deflector is controlled so that conditioned air is discharged in the direction in which people are not present when the command for powerful operation is entered. By this configuration, the room occupants can be prevented from experiencing discomfort due to excessive coldness during cooling operation, discomfort due to direct contact with warm air during heating, or other discomfort, for example.

The air conditioner according to a fourth aspect of the present invention is the air conditioner according to any of the first through third aspects, wherein the direction of the air deflector is fixed during powerful operation.

In this arrangement, the direction of the air deflector is fixed in the direction in which people are present when the command for powerful operation is entered. By this configuration, it is possible both to adequately impart the sensation of power to the person, and to reliably prevent the person from experiencing discomfort due to excessive coldness during cooling operation.

The air conditioner according to a fifth aspect of the present invention is the air conditioner according to any of the first through third aspects, wherein the swing range of the air deflector is changed during powerful operation.

In this arrangement, even when powerful operation is set with the air deflector in mid-swing, the swing range is changed to a range wherein the wind blows on the person. Since air is thereby blown directly onto the person by the setting of powerful operation, the sensation of power can thereby be imparted even when air is not blown directly onto the person before powerful operation. In contrast, the swing range can also be changed to a range wherein the wind does not blow on the person, even when powerful operation is set with the air deflector in mid-swing. By this configuration, wind can be reliably prevented from blowing directly onto the person during powerful operation even when conditioned air is blown directly onto the person prior to powerful operation.

The air conditioner according to a sixth aspect of the present invention is the air conditioner according to any of the first through fifth aspects, further provided with a timer for limiting the time in which powerful operation is performed.

In this arrangement, a timer is furthermore provided for limiting the time in which powerful operation is performed. The air conditioning capacity for cooling, heating, and the like can thereby be temporarily enhanced. The time in which powerful operation is performed is also limited by the timer also when the air deflector is adjusted in a direction whereby condensation is likely to form near the discharge vent during continuous operation. Consequently, the formation of condensation near the discharge vent can thereby be reliably prevented. It is also possible to limit the time in which powerful operation is performed, and to temporarily enhance the air conditioning capacity for cooling, heating, and the like.

The air conditioner according to a seventh aspect of the present invention is the air conditioner according to the sixth aspect, wherein a time at which the air deflector is stopped during powerful operation is set in the timer.

In this arrangement, a time is set in the timer at which the air deflector is stopped at a prescribed angle during powerful operation. The air deflector can therefore be caused to swing in a range that includes the direction in which people are present when a prescribed time has elapsed during powerful operation.

The air conditioner according to an eighth aspect of the present invention is the air conditioner according to any of the first through seventh aspects, wherein the air deflector is a vertically moving flap.

In this arrangement, the direction of the vertically moving flap in the air deflector is controlled, and it is determined whether the wind is or is not blowing towards a person. The air deflector can therefore be easily adjusted so as to point at a person merely by swinging the discharge direction up and down. The air deflector may also be adjusted so as not to point at a person.

The air conditioner according to a ninth aspect of the present invention is the air conditioner according to any of the first through eighth aspects, further comprises a sensor for detecting a person.

A sensor for detecting a person in the room is further comprised in this arrangement. By this configuration, the wind direction can be reliably adjusted so as to point towards a person during powerful operation, and can also be reliably adjusted so as to point away from a person.

The air conditioner according to a tenth aspect of the present invention is the air conditioner according to any of the first through ninth aspects, wherein the direction of the air deflector is adjusted when powerful operation is set during cooling operation.

In this arrangement, control of the direction of the air deflector during execution of powerful operation is only performed when the command for powerful operation is entered, particularly during cooling operation. In short, control is performed so that cold air is blown directly onto a person when powerful operation is performed during cooling. A stronger sensation of power can thereby be imparted by imparting the sensation of cold to the person. In contrast, control can also be performed so that cold air is not blown directly onto the person during powerful cooling operation. By this configuration, the person can be prevented from experiencing discomfort due to excessive coldness.

A method for controlling an air conditioner according to an eleventh aspect of the present invention is a method for controlling an air conditioner comprising an air conditioning mechanism for performing air conditioning of indoor air, and an air deflector for adjusting the direction in which the conditioned air is discharged; wherein the air conditioner

performs powerful operation whereby the capacity of the air conditioning mechanism is temporarily increased. The direction of the air deflector is thereby adjusted in accordance with the direction in which people are present during powerful operation.

In this arrangement, not only is the capacity of the air conditioning mechanism including the compressor, fan, or the like increased during powerful operation, but the direction in which conditioned air is discharged into the room is also controlled.

In the conventional method for controlling an air conditioner, the sole difference during powerful operation was that the capacity of the air conditioning mechanism was temporarily increased, and control of the discharge direction of air at that time was not addressed. The direction of the air deflector during powerful operation was determined by whatever direction the air deflector happened to be facing immediately before the command for powerful operation was entered. Consequently, even when the same powerful operation was executed during cooling, for example, the direction of the air deflector could sometimes vary according to the operating conditions immediately preceding the powerful operation.

Therefore, in the method for controlling an air conditioner according to the present invention, such effects as the following can be obtained by also controlling the direction of the air deflector during powerful operation.

Specifically, in the method for controlling an air conditioner according to the present invention, the direction of the air deflector is controlled so that conditioned air is discharged in the direction in which people are present when the command for powerful operation is entered. The user who entered the command for powerful operation can thereby experience the heightened effects of powerful operation by directly receiving the air that is conditioned in a state of increased capacity of the air conditioning mechanism. In contrast, it is also possible in the method for controlling an air conditioner according to the present invention for the direction of the air deflector to be controlled so that conditioned air is discharged in the direction in which people are not present when the command for powerful operation is entered. By this configuration, the room occupants can be prevented from experiencing discomfort due to excessive coldness during cooling operation, for example.

The method for controlling an air conditioner according to a twelfth aspect of the present invention is the method for controlling an air conditioner according to the eleventh aspect, wherein the direction of the air deflector is adjusted so that air is discharged in the direction in which people are present during powerful operation.

In the method for controlling an air conditioner according to the present invention, the direction of the air deflector is controlled so that conditioned air is discharged in the direction

in which people are present when the command for powerful operation is entered. The user who entered the command for powerful operation can thereby experience the heightened effects of powerful operation by directly receiving the air that is conditioned in a state of increased capacity of the air conditioning mechanism.

The method for controlling an air conditioner according to a thirteenth aspect of the present invention is the method for controlling an air conditioner according to the eleventh aspect, wherein the direction of the air deflector is adjusted so that air is discharged in the direction in which people are not present during powerful operation.

In the method for controlling an air conditioner according to the present invention, the direction of the air deflector is controlled so that conditioned air is discharged in the direction in which people are not present when the command for powerful operation is entered. By this configuration, the room occupants can be prevented from experiencing discomfort due to excessive coldness during cooling operation, for example.

BRIEF EXPLANATION OF DRAWINGS

FIG. 1 is an external view of an air conditioner in which the first embodiment of the present invention is employed;

FIG. 2 is a schematic diagram of the refrigerant circuit;

FIG. 3 is a sectional view along line A-A of the indoor unit;

FIG. 4 is an enlarged view of area B when the flap is in the horizontal position;

FIG. 5 is an enlarged view of area B when the flap is directed downward;

FIG. 6 is an enlarged view of area B when operation is stopped;

FIG. 7 is a block diagram showing the control unit;

FIG. 8 is a schematic diagram showing the direction in which air is discharged in the indoor unit according to the first embodiment; FIG. 8(a) is a schematic diagram showing the direction in which air is discharged from the indoor unit during normal cooling operation; and FIG. 8(b) is a schematic diagram showing the direction in which air is discharged from the indoor unit during powerful cooling operation;

FIG. 9 is a schematic diagram showing the direction in which air is discharged in the indoor unit according to Modification (B) of the first embodiment; FIG. 9(a) is a schematic diagram showing the swing range of the horizontal flap during normal cooling operation; and FIG. 9(b) is a schematic diagram showing the swing range of the horizontal flap during powerful cooling operation;

FIG. 10 is a schematic diagram showing the direction in which air is discharged in the indoor unit according to the second embodiment; FIG. 10(a) is a schematic diagram showing

the direction in which air is discharged from the indoor unit during normal cooling operation; and FIG. 10(b) is a schematic diagram showing the direction in which air is discharged from the indoor unit during powerful cooling operation; and

FIG. 11 is a schematic diagram showing the direction in which air is discharged in the indoor unit according to Modification (A) of the second embodiment; FIG. 11(a) is a schematic diagram showing the swing range of the horizontal flap during normal cooling operation; and FIG. 11(b) is a schematic diagram showing the swing range of the horizontal flap during powerful cooling operation.

KEY TO SYMBOLS

1	air conditioner
2	indoor unit
3	outdoor unit
11	indoor heat exchanger (air conditioning mechanism)
12	cross-flow fan (air conditioning mechanism)
13	fan motor
21	compressor (air conditioning mechanism)
41	ROM
42	RAM
44	infrared sensor (sensor)
45	timer
60	control unit
144	horizontal flap (vertically moving flap)
S	indoor

PREFERRED EMBODIMENTS

<FIRST EMBODIMENT>

<STRUCTURE OF AIR CONDITIONER>

FIG. 1 is an external view of the air conditioner 1 in which the first embodiment of the present invention is employed.

The air conditioner 1 is a device for blowing cooled or heated air, de-humidified air, or other conditioned air into a room and performing conditioning of indoor air. This air conditioner 1 is provided with an indoor unit 2 mounted at an upper portion of a wall surface inside a room, and an outdoor unit 3 disposed outdoors. The outdoor unit 3 is provided with an outdoor air conditioning unit 5 that houses an outdoor heat exchanger (air conditioning mechanism), an outdoor fan (air conditioning mechanism), and the like.

An indoor heat exchanger (air conditioning mechanism) is housed in the indoor unit 2, the outdoor heat exchanger is housed in the outdoor air conditioning unit 5, and the heat exchangers and a refrigerant pipe 6 for connecting these heat exchangers constitute a refrigerant circuit.

FIG. 2 shows a schematic diagram of the refrigerant circuit used in the air conditioner 1.

The indoor heat exchanger 11 is provided inside the indoor unit 2. This indoor heat exchanger 11 is composed of a heat transfer tube that is folded over a plurality of times at both ends in the longitudinal direction thereof, and a plurality of fins through which the heat transfer tube is inserted. This indoor heat exchanger 11 exchanges heat with the surrounding air.

A cross-flow fan (air conditioning mechanism) 12 is also provided inside the indoor unit 2, for blowing the air into the room after the indoor air has been drawn in and heat-exchanged with the indoor heat exchanger 11. The cross-flow fan 12 is formed in a cylindrical shape, and the peripheral surface thereof is provided with blades in the direction of the rotational axis thereof. The cross-flow fan 12 generates an airflow in the direction orthogonal to the axis of rotation. This cross-flow fan 12 is rotatably driven by a fan motor 13 provided inside the indoor unit 2.

A compressor (air conditioning mechanism) 21, a four-way switching valve 22, an accumulator 23, an outdoor heat exchanger 24, and a pressure-reducing device 25 are provided to the outdoor air conditioning unit 5 (see FIG. 2). The four-way switching valve 22 is connected to the discharge side of the compressor 21. The accumulator 23 is connected to the intake side of the compressor 21. The outdoor heat exchanger 24 is connected to the four-way switching valve 22. The pressure-reducing device 25 is an electric expansion valve connected to the outdoor heat exchanger 24. The pressure-reducing device 25 is also connected to a connection pipe 31 via a filter 26 and a liquid stop valve 27, and is connected to one end of the indoor heat exchanger 11 via the connection pipe 31. The four-way switching valve 22 is also connected to a connection pipe 32 via a gas stop valve 28, and is connected to the other end of the indoor heat exchanger 11 via this connection pipe 32. These connection pipes 31 and 32 correspond to the refrigerant pipe 6 in FIG. 1.

A sectional view of the indoor unit 2 is shown in FIG. 3. The indoor heat exchanger 11 and cross-flow fan 12 described previously are housed inside a casing 14 of the indoor unit 2. The indoor heat exchanger 11 is mounted so as to surround the cross-flow fan 12 from the front, from above, and from the top of the rear thereof. The air passes through the indoor

heat exchanger 11 by the cross-flow fan 12, and then heat exchange occurs between the air and the refrigerant flowing through the inside of the heat transfer tube.

A drain pan 141 for receiving water droplets that form on the surface of the indoor heat exchanger 11 during heat exchange is provided under the indoor heat exchanger 11. A drain hose (not shown) for discharging the received water droplets to the outside is mounted on the drain pan 141. The drain pan 141 is configured so as to receive such water droplets and drain out the water droplets through the drain hose.

An intake vent 142 composed of a plurality of slit-shaped openings is provided at the top of the casing 14. A discharge vent 143 composed of an opening elongated in the longitudinal direction of the indoor unit 2 is provided at the bottom of the casing 14. A horizontal flap (vertically moving flap) 144 for determining the discharge direction of the air blown into the room by the cross-flow fan 12 is provided to the discharge vent 143. This horizontal flap 144 is provided so as to be able to rotate about a shaft 145 that is parallel to the longitudinal direction of the indoor unit 2. The horizontal flap 144 is rotated by a flap motor 146 (see FIG. 7) described hereinafter, whereby the discharge direction of the air can be determined. As shown in FIG. 4, when the edge 144a of the horizontal flap 144 is oriented in an approximately horizontal direction, the conditioned air is discharged in an approximately horizontal direction. As shown in FIG. 5, when the edge 144a of the horizontal flap 144 is turned downward in an approximately vertical direction, the conditioned air is discharged downward in an approximately vertical direction. Furthermore, the edge 144a of the horizontal flap 144 is in contact with the edge of the casing 14 when operation of the air conditioner 1 is stopped, as shown in FIG. 6. The horizontal flap 144 in this case almost completely covers the discharge vent 143.

A propeller fan 29 for discharging to the outside the air that is heat-exchanged by the outdoor heat exchanger 24 is provided inside the outdoor air conditioning unit 5. This propeller fan 29 is rotatably driven by a propeller fan motor 30.

<CONTROL UNIT>

A control unit 60 is further provided to the air conditioner 1.

The control unit 60 is connected to the compressor 21, four-way switching valve 22, pressure-reducing device 25, ROM 41, RAM 42, fan motor 13, flap motor 146, temperature sensor 43, and infrared sensor 44, as shown in FIG. 7. The control unit 60 also communicates with a remote control 40, and the time of powerful operation is limited by a timer 45 working inside a program. The control unit 60 also controls the compressor 21, the four-way

switching valve 22, the pressure-reducing device 25, the fan motor 13, and the flap motor 146.

A control program and various parameters are stored in the ROM 41. Also stored in the ROM 41 are airflow settings for various set times, the positioning, swing range, and the like of the horizontal flap 144 when powerful operation is set, and other parameters.

The airflow setting is the operational airflow for determining the rate at which air is discharged from the discharge vent 143, and may be set to any of the following settings: "quiet," "slight breeze," "faint wind," "low," "medium," and "high." The "quiet" setting indicates the smallest operational airflow, and "high" indicates the highest operational airflow. The control unit 60 selects any one of the airflow settings based on a signal from the remote control 40 described hereinafter, and stores the selected airflow setting in the RAM 42. The control unit 60 also causes the fan motor 13 to rotate so that an amount of conditioned air corresponding to the selected airflow setting is blown into the room.

The remote control 40 is an operation device for transmitting a command from the room occupant to the air conditioner 1 and causing the air conditioner 1 to operate according to the wishes of the occupant. The occupant can set the room temperature, turn the swing function of the horizontal flap 144 on and off, select the swing mode, enter a command for powerful operation, and perform other functions using the remote control 40.

Powerful operation is a function whereby the air conditioning capacity can be temporarily enhanced by temporarily increasing the rotation speed of the cross-flow fan 12, the operating frequency of the compressor 21, and the like according to a command entered by the user. This powerful operation will be described in detail hereinafter.

These commands are transmitted to the control unit 60 from the remote control 40 and used for controlling each component. These commands are transmitted from the control unit 60 to the RAM 42 together with the presence-sensing results (information relating to the direction in which people are present) from the infrared sensor 44, and are stored in the RAM 42.

Furthermore, the target temperature T attained by the operation of the air conditioner 1 can also be set using the remote control 40. This target temperature T is transmitted from the remote control 40 to the control unit 60, and is used for controlling each component. This target temperature T is also transferred from the control unit 60 to the RAM 42 and stored in the RAM 42. For example, when the room temperature during cooling operation decreases by a prescribed temperature (t1) or more below the target temperature T, the control unit 60 stops the operation of the compressor 21 in order to minimize energy consumption by the air

conditioner 1. When stoppage of the compressor 21 causes the room temperature to increase by a prescribed temperature t2 or more above the target temperature T, the control unit 60 reactivates the compressor 21.

The temperature sensor 43 provided to the indoor unit 2 measures the temperature inside the room. The temperature sensor 43 transmits the measured room temperature to the control unit 60.

The infrared sensor (sensor) 44 is provided near the surface of the indoor unit 2, and is a presence sensor for detecting the presence of a person in the room. This infrared sensor 44 transmits to the control unit 60 information regarding the direction in which the detected person is present. Such detection using the infrared sensor 44 may be performed at all times, or at prescribed time intervals.

<POWERFUL OPERATION BY THE PRESENT AIR CONDITIONER>

Powerful operation in the air conditioner 1 during cooling operation and heating operation will next be described.

For example, when a user enters a command from the remote control 40 to perform powerful operation during cooling operation, the control unit 60 of the air conditioner 1 controls the fan motor 13 so as to increase the speed of the cross-flow fan 12, and controls the operating frequency of the compressor 21 in order to enhance the air conditioning capacity.

A particular feature of the air conditioner 1 of the present embodiment is that the control unit 60 controls the direction of the horizontal flap 144 in addition to performing the abovementioned control when the command for powerful operation is entered. During normal cooling operation, for example, conditioned air is blown into the room S in an approximately horizontal direction, as shown in FIG. 8(a). In this arrangement, when the command for powerful operation is entered, the flap motor 146 is controlled, and the direction of the horizontal flap 144 is adjusted so that the air heat-exchanged by the indoor heat exchanger 11 is blown towards the people as shown in FIG. 8(b), according to the detection results from the infrared sensor 44.

By this configuration, the direction of the horizontal flap 144 is controlled so as to always change to the direction in which people are present when the command for powerful operation is entered, regardless of what direction the horizontal flap 144 was in during operation prior to when the powerful operation command was entered. By entering the command for powerful operation, the user can thereby experience the sensation of power from powerful operation by directly receiving the conditioned air.

This type of powerful operation is also performed in the same manner during heating operation.

Powerful operation is a state in which the air conditioning capacity of the air conditioner 1 is temporarily increased, and the time in which powerful operation is performed is limited by the timer 45. This timer 45 begins measuring time after the control unit 60 receives the powerful operation command entered by the user, and transmits a signal to the control unit 60 when a prescribed time occurs. When the signal is received from the timer 45, the control unit 60 performs control so as to cause the fan motor 13, the compressor 21, and the flap motor 146 to return to the original normal operation state, causes powerful operation to end, and returns the system to normal operation.

In the air conditioner 1 of the present embodiment, a time is set in the timer 45 whereby condensation does not form in the vicinity of the discharge vent 143 even when there is a direct discharge of air near the discharge vent 143 during powerful cooling operation.

By this configuration, the problem of condensation forming near the discharge vent 143 can be reliably prevented by providing a time limit regardless of what direction the horizontal flap 144 is in during powerful cooling operation.

<FEATURES OF THE PRESENT AIR CONDITIONER>

<1>

The air conditioner 1 of the first embodiment temporarily increases the rotational speed of the cross-flow fan 12, the operating frequency of the compressor 21, and the like, enhances the air conditioning capacity, and even so much as controls the wind direction when a command for powerful operation is entered from the remote control 40.

Even in the conventional air conditioner, the fan speed, the operating frequency of the compressor, and the like are increased when a command for this type of temporary enhancement of capacity is entered. However, since this control does not extend to the discharge direction of the air fed into the room, the wind direction is determined by whatever direction the horizontal flap happens to be in immediately before the powerful operation command is entered.

Therefore, by controlling the direction of the horizontal flap 144 even during the so-called powerful operation for temporarily increasing the air conditioning capacity in the air conditioner 1 of the present embodiment, air that is conditioned in a state of increased capacity can be discharged in the desired direction.

A particular feature of the air conditioner 1 of the present embodiment is that the direction of the horizontal flap 144 is controlled so that conditioned air is discharged in the direction in which people are present in the room.

Thus, when powerful operation is set by the user, since conditioned air is blown towards the user, the user can experience the heightened effects of powerful operation.

<2>

The air conditioner 1 of the first embodiment detects the direction in which people are present in the room using the infrared sensor 44.

The direction of the horizontal flap 144 can thereby be adjusted to ensure that wind blows directly on the people regardless of where the people are in the room.

<3>

When the command for powerful operation is entered in the air conditioner 1 of the first embodiment, the direction of the horizontal flap 144 is fixed, and conditioned air is blown in the direction in which people are present.

The users in the room can thereby be ensured to experience the heightened effects of powerful operation.

<4>

The air conditioner 1 of the first embodiment uses the timer 45 to limit the time in which powerful operation is performed.

It thereby becomes possible to perform control so that powerful operation increases the air conditioning capacity temporarily.

<5>

In the air conditioner 1 of the first embodiment, a time is set in the timer 45 whereby condensation does not form near the discharge vent 143 of the indoor unit 2.

In powerful operation during cooling, conditioned air usually comes in contact with the area near the discharge vent as well when the horizontal flap 144 is turned towards where people are present. In such a case, condensation can form near the discharge vent when cold air continues to be discharged unchanged for a long period of time.

Therefore, in the air conditioner 1 of the present embodiment, the formation of condensation near the discharge vent 143 can be reliably prevented by limiting the time in which the horizontal flap 144 is directed in such a direction.

<6>

The air conditioner 1 of the first embodiment controls the discharge direction of air fed into the room using the horizontal flap 144.

By thus performing control using a horizontal flap 144 for adjusting the vertical wind direction, the air can be blown towards people more easily than by controlling the direction of a vertically moving flap.

<MODIFICATIONS OF THE FIRST EMBODIMENT>

The first embodiment of the present invention was described above, but the present invention is in no way limited by the abovementioned embodiment, and can include various modifications within the intended scope thereof.

<A>

The first embodiment was described by way of an example wherein the direction in which people are present is detected using the infrared sensor 44, and the air conditioned during powerful operation is blown in that direction. However, the present invention is not limited to this configuration. For example, the sensor may be omitted, and conditioned air may be blown towards a specified range in which people are assumed to be present.

The sensor need not be an infrared sensor as long as it is capable of detecting where people are present, and another type of sensor may be used.

<B>

In the first embodiment, an example was described in which the direction of the horizontal flap 144 is fixed in the direction of people during powerful operation. However, the present invention is not limited to this configuration. For example, as shown in FIG. 9(a), when the horizontal flap 144 is swinging between an approximately horizontal direction and a direction a few degrees below the horizontal direction during normal cooling operation, the horizontal flap 144 may be caused to swing in a range that is enlarged so as to include the direction in which people are present, as shown in FIG. 9(b). Even in this case, since the user can directly feel the air discharged during powerful operation, the heightened effects of powerful operation can be imparted to the user in the same manner as when the horizontal flap 144 is fixed so as to point towards where people are present.

<C>

In the first embodiment, an example was described in which the direction of the horizontal flap 144 is controlled, and the air conditioned during powerful operation is discharged into the room in the vertical direction in which people are present. However, the present invention is not limited to this configuration. For example, the wind direction may also be controlled in the left-right direction using a vertically moving flap, and the wind direction may be controlled using both a vertically moving flap and the horizontal flap 144.

<D>

In the first embodiment, an example was described in which the direction of the horizontal flap 144 is controlled so that conditioned air is blown in the direction in which people are present when a command for performing powerful operation is entered, during both cooling operation and heating operation. However, the present invention is not limited to this configuration. For example, control of the direction of the horizontal flap 144 may be limited so that conditioned air is blown in the direction towards people only when the command for powerful operation is entered during cooling operation.

The user can thereby be caused to feel the coldness of powerful operation during cooling, and to better experience the heightened effects of powerful operation.

<E>

An example was described in the first embodiment in which the time for performing powerful operation is limited by the timer 45. However, the present invention is not limited to this configuration. For example, a time in which the direction of the horizontal flap 144 is fixed during powerful operation may be set in the timer 45. In this case, the horizontal flap 144 fixed at a prescribed angle during powerful operation may be controlled so as to swing after a time limit that is set in the timer 45 has elapsed.

<SECOND EMBODIMENT>

An air conditioner according to the second embodiment differs from the air conditioner of the first embodiment in that the control unit 60 controls the flap motor 146 so that the air heat-exchanged (air-conditioned) with the indoor heat exchanger 11 is blown in a direction in which people are not present, and the direction of the horizontal flap 144 is adjusted. Consequently, only the operation of the air conditioner during powerful operation is described herein.

<POWERFUL OPERATION BY THE AIR CONDITIONER>

Powerful operation of the air conditioner 1 during cooling operation and heating operation will next be described.

For example, when a user enters a command from the remote control 40 to perform powerful operation during cooling operation, the control unit 60 of the air conditioner 1 controls the fan motor 13 so as to increase the speed of the cross-flow fan 12, and controls the operating frequency of the compressor 21 in order to enhance the air conditioning capacity.

A particular feature of the air conditioner 1 of the second embodiment is that the control unit 60 controls the direction of the horizontal flap 144 in addition to performing the control described in the first embodiment when the command for powerful operation is entered. During cooling operation, for example, conditioned air is blown into the room S

somewhat downward from the approximately horizontal direction, as shown in FIG. 10(a). In this arrangement, when the command for powerful operation is entered, the flap motor 146 is controlled, and the direction of the horizontal flap 144 is adjusted so that the air heat-exchanged (air-conditioned) by the indoor heat exchanger 11 is blown in a direction in which people are not present, as shown in FIG. 10(b), according to the detection results from the infrared sensor 44.

By this configuration, the direction of the horizontal flap 144 is controlled so as to always change to the direction in which people are not present when the command for powerful operation is entered, regardless of what direction the horizontal flap 144 was in during operation prior to when the powerful operation command was entered. Even when the command for powerful operation is entered, the room occupants can thus be comfortable in the room without experiencing excessive coldness from being directly blown on during cooling.

This type of powerful operation is also performed in the same manner during heating operation.

Powerful operation is a state in which the air conditioning capacity of the air conditioner 1 is temporarily increased, and the time in which powerful operation is performed is limited by the timer 45. This timer 45 begins measuring time after the control unit 60 receives the powerful operation command entered by the user, and transmits a signal to the control unit 60 when a prescribed time occurs. When the signal is received from the timer 45, the control unit 60 performs control so as to cause the fan motor 13, the compressor 21, and the flap motor 146 to return to the original normal operation state, causes powerful operation to end, and returns the system to normal operation.

<FEATURES OF THE AIR CONDITIONER>

<1>

The air conditioner 1 of the second embodiment temporarily increases the rotational speed of the cross-flow fan 12, the operating frequency of the compressor 21, and the like, enhances the air conditioning capacity, and even so much as controls the wind direction when a command for powerful operation is entered from the remote control 40.

Even in the conventional air conditioner, the fan speed, operating frequency of the compressor, and the like are increased when a command for this type of temporary enhancement of capacity is entered. However, since this control does not extend to the discharge direction of the air fed into the room at this time, the wind direction is determined by whatever direction the horizontal flap 144 happens to be in immediately before the

powerful operation command is entered. As a result, the horizontal flap 144 is sometimes oriented in the direction in which people are present after powerful operation is initiated, and the conditioned air blows directly on the people and causes discomfort.

Therefore, by controlling the direction of the horizontal flap 144 even during the so-called powerful operation in which the air conditioning capacity is temporarily increased in the air conditioner 1 of the present embodiment, air that is conditioned in a state of increased capacity can be discharged in the desired direction.

A particular feature of the air conditioner 1 of the present embodiment is that the direction of the horizontal flap 144 is controlled so that conditioned air is discharged away from the direction in which people are present in the room.

Thus, when powerful operation is set by the user, the conditioned air is discharged in a direction other than the direction in which people are present; for example, towards the ceiling, or in another direction. Even when powerful operation is set during cooling, for example, cold air can be prevented from blowing directly on the people. Powerful operation can therefore be performed without causing discomfort due to excessive coldness.

<2>

The air conditioner 1 of the second embodiment detects the direction in which people are present in the room using the infrared sensor 44.

The direction of the horizontal flap 144 can thereby be adjusted to ensure that wind does not blow directly on the people regardless of where the people are in the room.

<3>

When the command for powerful operation is entered in the air conditioner 1 of the second embodiment, the direction of the horizontal flap 144 is fixed, and conditioned air is blown in the direction in which people are not present.

The users in the room can thereby be prevented from experiencing discomfort of excessive coldness from coming in direct contact with cold air during cooling, for example.

<4>

The air conditioner 1 of the second embodiment limits the time in which powerful operation is performed using a timer 45 working inside the program.

It thereby becomes possible to perform control so that powerful operation increases the air conditioning capacity temporarily.

<5>

The air conditioner 1 of the second embodiment controls the discharge direction of air fed into the room using the horizontal flap 144.

By thus performing control using a horizontal flap 144 for adjusting the vertical wind direction, the air can be blown in a direction where people are not present more easily than by controlling the direction of a vertically moving flap.

<MODIFICATIONS OF THE SECOND EMBODIMENT>

An embodiment of the present invention was described above, but the present invention is not limited by the abovementioned embodiment, and can include various modifications within the intended scope thereof.

<A>

In the second embodiment, an example was described in which the direction of the horizontal flap 144 is fixed in a direction in which people are not present during powerful operation. However, the present invention is not limited to this configuration. For example, as shown in FIG. 11(a), when the horizontal flap 144 is swinging between the horizontal direction and a direction a few degrees downward during cooling operation, the horizontal flap 144 may be caused to swing within a range that does not include the direction in which people are present during powerful operation, as shown in FIG. 11(b). Even in this case, since the user is not directly affected by the air discharged during powerful operation, powerful operation can be performed without causing discomfort, the same as when the horizontal flap 144 is fixed so as to point away from where people are present.

<B>

In the second embodiment, an example was described in which the direction of the horizontal flap 144 is controlled, and the air conditioned during powerful operation is discharged into the room in the vertical direction in which people are not present. However, the present invention is not limited to this configuration. For example, the wind direction may also be controlled in the left-right direction using a vertically moving flap, or using both the horizontal flap 144 and a vertically moving flap.

<C>

In the second embodiment, an example was described in which the direction of the horizontal flap 144 is controlled so that conditioned air is blown in a direction in which people are not present when a command for performing powerful operation is entered, during both cooling operation and heating operation. However, the present invention is not limited to this configuration. For example, control of the direction of the horizontal flap 144 may be limited so that conditioned air is blown in a direction away from people only when the command for powerful operation is entered during cooling operation.

<INDUSTRIAL APPLICABILITY>

The present invention demonstrates effects whereby the direction in which conditioned air is blown during powerful operation can be controlled, and can therefore be applied in an air conditioner capable of performing powerful operation during both cooling operation and heating operation.